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1979 Insect Pest Management Guide

FIELD and FORAGE CROPS

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ILLINOIS DOCUMENTS

You must be certified as a pesticide applicator to use restricted-use pesticides.
See your county Extension adviser in agriculture for information.

FEDERAL AND STATE LAWS

The U.S. Environmental Protection Agency is classifying pesticides for "general" or "restricted" use. Anyone applying a restricted-use pesticide must be certified. Only a few pesticides have been classified.

Commercial applicators who apply restricted-use pesticides must be certified. Commercial applicators include not only persons applying a pesticide for hire but also governmental personnel, chemical company representatives, and others involved in demonstrational, regulatory, and public health pest control. Certification as a commercial applicator requires passing a written examination administered either by the Illinois Department of Agriculture or the Department of Public Health.

Private applicators who use restricted-use pesticides "for the purpose of producing any agricultural commodity on property owned or rented by him or as exchange labor (no compensation) on the property of another" must also be certified, either by attending an educational training program or by passing an examination.

Educational training programs for farmers (private applicators) and commercial pesticide applicators are conducted by the Cooperative Extension Service to prepare persons for certification. For additional information, consult your county Extension adviser in agriculture. The actual certification and the issuing of permits or licenses are handled by the Illinois Department of Agriculture or the Illinois Department of Public Health.

The chlorinated hydrocarbons — aldrin, chlordane, dieldrin, endrin, heptachlor, and lindane — cannot be used on dairy farms except around the farm residence. This ruling was adopted by the Illinois Department of Public Health.

Asterisks (*) are used throughout this circular to indicate insecticides classified for "restricted" use by the U.S. Environmental Protection Agency.

Consider all grain fumigants as restricted-use insecticides.

INSECTICIDES AND CLASSIFICATIONS

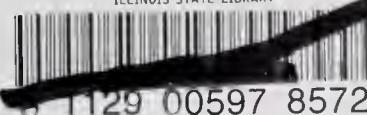
At the time this publication was in preparation, only a few of the insecticides listed below had been classified for either "restricted" or "general" use by the EPA. Additional insecticides are expected to be classified before the 1979 planting season. Your county Extension adviser will have additional information on insecticide restrictions.

The chemical names used in this circular may be unfamiliar to you. These names are the common, coined chemical names and as such are not capitalized (for example, terbufos). Trade names are capitalized (for example, Counter). In the table of limitations, the trade names are listed first, with the common name in parentheses following the trade name. In the tables of suggestions, only the trade name is used if there is one. For questions, refer to the list shown below or to the table of limitations given on page 11.

Trade name	Common name	Classification
Counter	terbufos	unclassified
Cygon	dimethoate	unclassified
diazinon	diazinon	unclassified
Dibrom	naled	unclassified
Di-Syston	disulfoton	unclassified
Dyfonate	fonofos	unclassified
Dylox	trichlorfon	unclassified
*ethyl parathion	parathion	restricted
Furadan	carbofuran	unclassified
*Guthion	azinphosmethyl	restricted
Imidan	phosmet	unclassified
*Lannate	methomyl	restricted ¹
Lorsban	chlorpyrifos	unclassified
malathion	malathion	unclassified
Meta-Systox R	oxydemetonmethyl	unclassified
*methyl parathion	methyl parathion	restricted
Mocap	ethoprop	unclassified
*PennCap-M	methyl parathion (microencapsulated)	restricted
Sevin	carbaryl	unclassified
Supracide	methadathion	unclassified
*Systox	demeton	restricted
Thimet	phorate	unclassified
toxaphene	toxaphene	unclassified
Trithion	carbophenothion	unclassified

¹ All formulations except water-soluble packages are restricted.

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GENERAL SUGGESTIONS FOR INSECT CONTROL

Predicting the Need for Soil Insecticides on Corn

The type of crop rotation influences to a great extent whether a soil-insect problem will occur and what kind. Some guidelines follow for predicting soil-insect problems in corn and for determining the need to use a soil insecticide at planting time. Exceptions can be expected occasionally since soil-insect problems are influenced by a variety of things unrelated to crop rotation—the weather, soil type, planting date, hybrid used, tillage, natural enemies, and so on. Knowledge about soil-insect damage in a particular field during previous years is also helpful, since infestations tend to occur in the same fields and in the same area.

Corn After Soybeans

The potential for soil-insect problems in corn following soybeans is generally low. Soil insecticides are rarely necessary. In most fields of corn after soybeans, a diazinon planter-box seed treatment will be adequate to protect against attack by seed-corn beetles and seed-corn maggots. There are a few exceptions. *Corn rootworms* may be a problem occasionally when beetles deposit their eggs in soybean fields that contain volunteer corn. When such fields are planted to corn the following year, economic damage may occur. Rootworm beetles will feed on the foliage of soybean plants. These beetles are especially attracted to soybean fields that are weedy or that contain volunteer corn. Good weed control will reduce the attractiveness of soybean fields to rootworm beetles. Clean fields of soybeans will permit soybean-corn rotations with non-economic damage from corn rootworms. *Black cutworms* may be a problem in corn where excess soybean plant debris remains on the soil surface. *White grubs* are an occasional problem in east-central Illinois in corn after soybeans.

Corn After Corn

The potential for rootworm damage is moderate to severe in the northern two-thirds of Illinois. A rootworm insecticide may be needed in fields of continuous corn. Wireworms are occasionally a problem in the southern portions of Illinois.

Corn After Grass Sod

Wireworms and white grubs are potential problems. Apply a soil insecticide at planting time.

Corn After Clover and Alfalfa

Grape colaspis, grubs, wireworms, and cutworms are potential problems. In northern Illinois, rootworms may present a problem in corn following clover or alfalfa. Apply a soil insecticide at planting time.

Corn After Small Grain

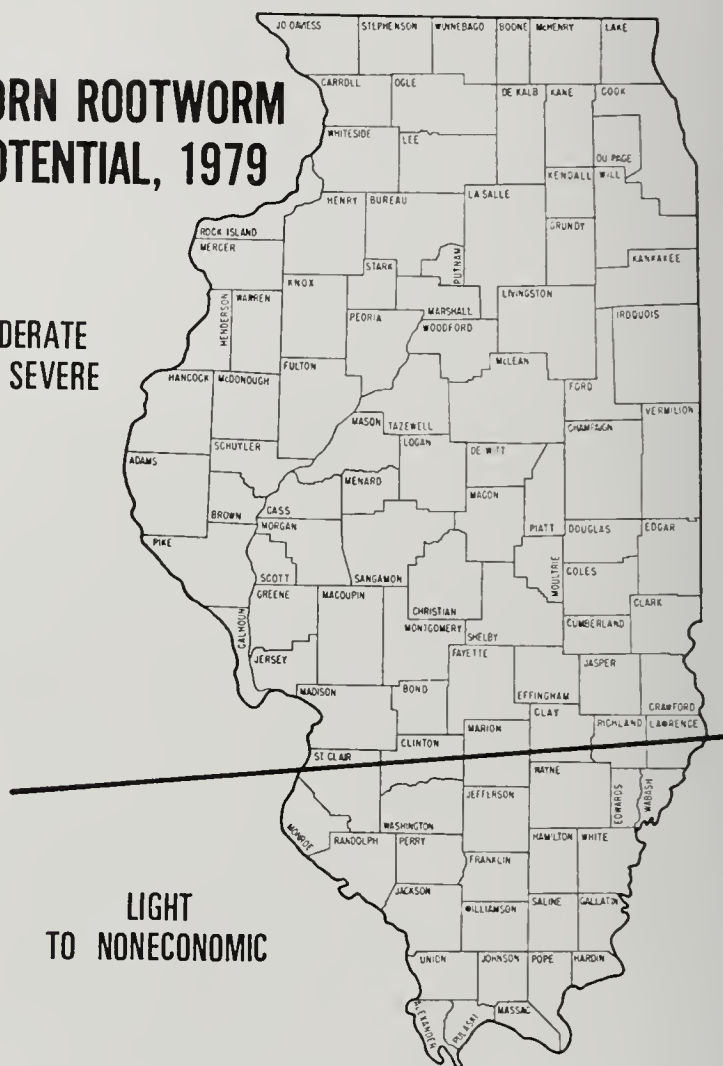
There is a slight potential for damage by wireworms, seed-corn beetles, and seed-corn maggots. In most instances, a diazinon planter-box seed treatment will be adequate. If wireworms are present, use a soil insecticide at planting time.

CORN ROOTWORM SITUATION, 1979

Moderate to severe damage by western and northern corn rootworm larvae can be expected in many fields of corn that follow corn in the area north of a line from Belleville to Lawrenceville (see map). The potential for rootworm damage south of this line is low. These predictions are based on a survey of rootworm beetle populations taken in August, 1978.

CORN ROOTWORM POTENTIAL, 1979

MODERATE
TO SEVERE



LIGHT
TO NONECONOMIC

Although the populations of western and northern corn rootworm beetles declined by 50 percent or more in some counties during 1978, there still is a potential for damage in continuous corn in the northern two-thirds of Illinois. A major factor responsible for the decline of rootworm beetle populations in 1978 was late planting.

Corn growers should base the need for using a soil in-

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secticide in 1979 on the abundance of rootworm beetles in fields in August, 1978. If the rootworm beetles averaged 1 or more per plant at any time during late July or August, 1978, plan to use a rootworm soil insecticide if the field is to be replanted to corn in 1979.

Fields of corn planted in late May or June, 1978, may have extensive rootworm damage if planted to corn in 1979. Late-planted fields of corn very likely attracted high numbers of rootworm beetles from adjacent fields seeking pollen and silks to feed on during August, 1978. Millions of eggs were laid in these late-planted fields of corn. Planting those fields to a crop other than corn in 1979 will help reduce the overall rootworm population.

SUGGESTIONS FOR ROOTWORM CONTROL, 1979

1. CROP ROTATION. This is the most effective method of preventing damage from corn rootworm larvae. If feasible, do not grow corn 2 years in succession in the same field. This greatly reduces the number of egg-laying beetles. When a crop other than corn is planted in a field with soil containing millions of rootworm eggs, millions of larvae will perish and so cannot emerge as egg-laying beetles. The larvae hatching from rootworm eggs cannot survive on the roots of broadleaf weeds or broadleaf crops (soybeans or alfalfa).

An exception might be when corn is planted after soybeans where there was an extensive infestation of volunteer corn or weeds in the soybeans during August. Rootworm beetles may be attracted to these weedy fields, depositing eggs there.

Corn following alfalfa may benefit from an insecticide treatment. Rootworm beetles occasionally deposit their eggs in alfalfa fields during the bloom stage in August.

2. SOIL INSECTICIDES. Following are suggestions for rootworm control using insecticides.

Planting-Time Treatments. Apply Counter, Dyfonate, Furadan, Lorsban, Mocap, or Thimet in a 7-inch band ahead of the press wheel at the recommended rate (see table). These soil insecticides will give 50- to 70-percent control of corn rootworm larvae. This is adequate to prevent economic larval damage in most fields. In some heavily infested fields, enough larvae may survive to cause economic root damage. Planting-time treatments applied in early April may give marginal control. Consider a late-

May cultivator application in such fields, rather than a planting-time treatment.

NOTE: *If a soil insecticide gave good results in 1978, it will probably provide adequate control in 1979. Exceptions have occurred when a particular insecticide has been used for several consecutive years in the same field. If an insecticide gave poor control last year, switch to another one in 1979.*

Research conducted during 1976-1978 indicates that switching from a carbamate (Furadan) to an organic phosphate (Counter, Dyfonate, Lorsban, Mocap, or Thimet) may be desirable, particularly if Furadan has been used for several consecutive years. If control with an organic phosphate was poor last year, switch to a carbamate (Furadan). In fields where Furadan provided poor or marginal rootworm control, it may be advisable to wait longer than a year before using Furadan again.

A word of caution about rotating classes of soil insecticides: The performance of an insecticide that gives only fair control of rootworms will not be improved by rotation with other insecticides. Performance might be enhanced under favorable weather conditions or with light infestations.

The theory of rotating classes of rootworm soil insecticides, while basically sound, may be only a short-term solution to a long-term problem. Whenever insecticides, regardless of type, are used continuously and extensively over a large area, insect resistance to those insecticides is likely to occur.

During 1977-78, rootworm control research was conducted at 23 sites. Counter gave effective control in 22 of 23 tests; Furadan, in 20 of 23; Dyfonate, in 20 of 23; Thimet, in 20 of 23; Mocap, in 18 of 23; and Lorsban, in 16 of 23 tests. Control in these tests was considered marginal for a treatment if enough brace roots were damaged by larvae to cause yield losses. CAUTION: These tests do not necessarily indicate that similar results would occur in 1979.

Liquid formulations of Furadan 4F or Dyfonate 4E may be mixed with water and applied as a spray in a 7-inch band ahead of the press wheel or mixed with liquid fertilizer and used with a split-boot application at planting time. Mocap 6E is labeled as a band spray mixed with water. Some farmers experienced problems with compati-

Soil Insecticides Suggested for Corn Rootworm Control at Planting Time, 1979

Insecticide	Class	Ounces of product per 1,000 ft. of row	Pounds of product needed per acre			
			40" rows	38" rows	36" rows	30" rows
Counter 15G	organic phosphate	8	6.7	7.0	7.4	8.7
Dyfonate 20G	organic phosphate	6	5.0	5.3	5.6	6.7
Furadan 10G	carbamate	12	10.0	10.5	11.1	13.3
Lorsban 15G	organic phosphate	8	6.7	7.0	7.4	8.7
Mocap 10G	organic phosphate	12	10.0	10.5	11.1	13.3
Thimet 15G	organic phosphate	8	6.7	7.0	7.4	8.7

bility or crop injury when using liquid insecticide-fertilizer treatments at planting time in 1978. The liquid insecticide **MUST** be compatible with the liquid fertilizer. A test should be conducted to make certain the mixture is physically compatible before planting. Maintain agitation in the tank after mixing and during application. *Use caution when handling liquid formulations. They are more toxic than granular formulations.*

NOTE: Broadcast applications of liquid and granular insecticides are not registered for rootworm control.

Cultivator Treatments. Apply granular Dyfonate, Furadan, Mocap, or Thimet in a band at the base of the plants just ahead of the cultivator shovels. Cover the granules with soil. The best time to apply a basal treatment of a soil insecticide by cultivator is in late May, near the beginning of egg-hatch. Such a treatment may be more effective than planting-time treatments in early April.

Cultivator applications of rootworm soil insecticides have some limitations. If rainfall is low for 3 or 4 weeks following the treatment, the insecticide granules will remain on the soil surface, rather than moving down to where the larvae are feeding; hence, control will be marginal. With excessive rainfall, it may not be possible to make the cultivator application at the desired time.

3. **CONTROL OF ROOTWORM BEETLES.** At present, we suggest using aerial applications of insecticides to control rootworm beetles only where pollination damage may occur due to silk-clipping. We do not suggest using insecticides to control rootworm beetles as a means of reducing or eliminating next year's larval infestations. Research thus far indicates that such control efforts have produced variable results. In general, the soil insecticide alone has been as effective as beetle control in late July or early August plus a soil treatment the following spring.

4. **VARIETY SELECTION.** Choose a variety that has good standability and root-generating capability. No varieties are resistant to corn rootworm larvae, but some have more potential for root regeneration than others.

USE SCOUTING TO DETERMINE ROOTWORM POTENTIAL

The presence or absence of rootworm beetles in a cornfield is an excellent indicator of future rootworm problems. Corn growers can determine the potential for rootworm damage in 1980 by counting western and northern corn rootworm beetles between July 25 and August 25, 1979, in this way:

1. Count beetles only in the fields that are to be replanted to corn in 1980.
2. Make 2 and preferably 3 counts for western and northern corn rootworm beetles at 7- to 10-day intervals between July 25 and August 25 in each field.
3. If you enter a field and discover a "fog" of beetles, do not bother with the detailed counts.

4. Count the total number of western and northern corn rootworm beetles on 50 plants each time. Examine 10 plants selected at random in 5 areas of the field. About 45 minutes would be required to make the counts in a 40-acre field.

5. Move quietly as you approach a plant in order not to disturb the beetles. Count the beetles on the entire plant. This includes the ear tip, tassel, leaf surface, and behind the leaf axils. Pull the leaves away from the stalk and look in the leaf axils.

6. For the ear-tip count, grasp the ear tip so the silks are enclosed in the palm of the hand, and squeeze before any of the beetles escape. Cut off the ear tip with a knife, cutting only the silks. Open your hand slowly. Count the beetles that come out of the silks for each of the 50 plants.

7. Record the number of beetles you find per plant. If the average is more than half a beetle per plant for any sampling date, plan to apply a rootworm insecticide in 1980. Any field that averages less than half a beetle per plant for all the counts can be planted to corn in 1980 without a soil-insecticide treatment.

BLACK CUTWORMS

Cutworm infestations and damage were extremely high in some areas in 1978. It is impossible to forecast the situation for 1979. The factors, individually or in combination, that tend to favor cutworm outbreaks include late-planting, infestations of broadleaf weeds prior to planting, reduced tillage, spring tillage, and corn following soybeans. Of these, the most important factors may be late-planting and preplant weed infestations. Fields that are planted late are more likely to develop a preplant weed infestation, which is often attractive to cutworm moths as a site to deposit their eggs than fields planted at the usual time.

Fields with combinations of the factors listed are likely candidates for cutworm damage, and should be monitored closely as the corn emerges. The probability for cutworm damage is slightly greater when corn follows soybeans and when fields are tilled in the spring or when reduced tillage is employed.

Currently, two options are available for cutworm control: planting-time applications of soil insecticides to prevent damage; and "rescue" treatments, after the damage appears. Both have limitations.

Planting-time treatments of Mocap 10G and Lorsban 15G have label registration by the Environmental Protection Agency for the control of black cutworms. Some growers may want to use one of these in their high-risk fields. The label for Lorsban 15G says it "will control moderate to low infestations of cutworms." The label for Mocap 10G says it will "aid in the control" of black cutworms. Lorsban has given better control of cutworms than Mocap in research trials.

Research indicates that planting-time treatments of

Mocap or Lorsban are relatively effective in controlling light to moderate infestations of cutworms, but control may be unsatisfactory with heavy infestations. Because of the uncertainty in predicting which fields will have light or moderate outbreaks of cutworms, it may be more feasible to use "rescue" treatments when cutworm outbreaks appear than to rely on a planting-time treatment.

"Rescue" (or "emergency") treatments to control outbreaks of cutworms include sprays of Lorsban, Sevin, or Dylox, or using the Sevin pelletized bait. Broadcast the pelletized bait on the surface, but do not incorporate. Lorsban sprays should be broadcast. Sprays of Sevin may be banded over the row or broadcast, but rates need to be increased if broadcast. Dylox sprays should be banded.

The keys to effective cutworm control with the rescue treatments listed are the amount of surface moisture and the movement of the worms. Control may be poor if the topsoil is dry and crusted and the worms are working below the soil surface, regardless of the insecticide used. Cutworm control under hot, dry soil conditions may be enhanced by cultivating or running a rotary hoe over the field soon after spraying. This disruption may cause the worms to move around and come into contact with the insecticide.

To determine the need for rescue treatments, scout the fields during plant emergence, particularly those considered to be high-risk fields. Early detection of leaf-feeding or of cutting by cutworms is vital for effective control. When the corn plants are beginning to emerge, check the fields for leaf-feeding, cutting, wilting, or missing plants. Small cutworm larvae (less than half an inch) feed on the leaves and do not begin cutting plants until they are about half grown. If you find 3 percent or more of the plants being cut and 2 or more half-grown cutworms per 100 plants, a control measure is needed.

EUROPEAN CORN BORERS

The potential for damage by first-generation European corn borers in 1979 is high throughout Illinois. Populations of European corn borers last fall were the highest since the mid-1950's. The greater the fall population of corn borer larvae, in general, the greater the potential for damage by first-generation borers the following June and July.

Corn that is planted early (the fields with the tallest corn) should be monitored closely for signs of whorl-feeding by corn borer larvae from mid-June to early July. The fields with the tallest corn are the most attractive ones for egg-laying by first-brood moths. Control is warranted if 50 percent or more of the plants have fresh whorl-feeding and a plant height (with the leaves extended) of 36 inches or more.

Corn borer moths begin to emerge in late May in southern Illinois and mid-to-late June in the central and

northern regions. The females lay most of their eggs in the evening. The daylight hours are spent in fence rows and other protected areas.

The eggs, which are laid in masses, are usually deposited near the midrib on the underside of the lower corn leaves. Calm nights favor egg deposition by the moths. The absence of hard, beating rains during moth emergence also increases the potential for infestations by corn borers. Reduced tillage systems that do not destroy or cover the corn stubble will help the overwintering borers survive and will increase the potential for attack by first-generation borers. However, plowing is not suggested in fields where soil erosion may occur.

First-generation borers reduce yields by stalk-tunneling. This weakens the plant and destroys tissue used to transport food within the plant.

Some hybrids are available with varying degrees of tolerance or resistance to leaf-feeding by first-generation borers. Growers should consider this trait when selecting varieties for 1979.

Corn planted late is most attractive to moths laying eggs for the second generation. Fields should be monitored from mid-July to mid-August for egg masses or newly hatched larvae of the second brood. Yield losses from this brood are due to stalk breakage (physical damage) as well as to physiological damage.

PLANTER-BOX SEED TREATMENTS

Corn

A planter-box seed treatment with diazinon will protect corn against attack by seed corn beetles and maggots during germination. Use a seed treatment in fields that do not receive a soil insecticide at planting time, or when Furadan is applied at planting time. The diazinon planter-box seed treatment is not needed if Counter, Dyfonate, Lorsban, Mocap, or Thimet is applied at planting. NOTE: Some loss of the seed treater will occur in air planters. Excess dust from the seed treater may also interfere with the monitor in air planters.

Soybeans

Use 1½ ounces of diazinon seed-protectant as an active ingredient per bushel of seed in order to prevent damage from seedcorn maggots. Follow label directions for application.

NO-TILL CORN

Soil insecticides can be profitably applied to corn following grass sod, or in any rotation in which grasses and weeds are prevalent. In no-till corn research trials, Furadan has controlled armyworms, billbugs, and flea beetles and has suppressed common stalk borers, first-generation European corn borers, wireworms, and white grubs when applied at 2 pounds of active ingredient per acre at plant-

ing time in the furrow, or as a 7-inch band ahead of the press wheel. Lower rates of Furadan are less effective against this insect complex, but may give better results than other soil insecticides. Growers with a no-till corn program may wish to apply Furadan at planting time.

On no-till corn following corn (except in the rootworm area), soybeans, or a small grain, applying a soil insecticide generally does not pay. However, a diazinon seed treatment should be used.

Thimet, Dyfonate, Counter, Mocap, and Furadan will provide some control of wireworms and white grubs in no-till corn planted in grass sod.

ALFALFA WEEVILS

In 1979, we expect alfalfa weevils to cause moderate to severe damage to the first cutting of alfalfa in all areas of Illinois. Growers should inspect alfalfa fields closely during April and May for signs of weevil damage.

PEST MANAGEMENT

In recent years, "pest scouting" programs have been initiated to serve growers by several pest-management consulting firms. Scouts monitor fields for outbreaks of pests and keep a close watch on potential problems. Identifying and controlling pest outbreaks early through scouting programs could save a farmer thousands of dollars. The scout's observations can also be used to determine the need for applying a rootworm soil insecticide the following year.

For additional information on the pest-management scouting programs, consult your county Extension adviser in agriculture.

PESTICIDE SAFETY

Certain precautionary steps should be taken when handling insecticides. Some of the insecticides suggested in this publication can be poisonous to the applicator. The farmer is expected to protect himself, his workers, and his family from needless exposure.

When using insecticides, apply all the scientific knowledge available to make sure there will be no illegal residue on the marketed crop. Such knowledge is condensed on the label. **READ THE LABEL CAREFULLY AND FOLLOW THE INSTRUCTIONS.** The label should be recent and not from a container several years old. Do not exceed the maximum rates suggested. Observe the interval between application and harvest. Apply only to crops for which use has been approved. Make a record of the product used, the trade name, the percentage content of the insecticide, the dilution, the rate of application per acre, and the date or dates of application.

Always handle insecticides with respect. The persons most likely to suffer ill effects from insecticides are the applicator and his family. Accidents and careless, needless

overexposure can be avoided. Following these rules will prevent most insecticide accidents:

1. Wear rubber gloves when handling insecticide concentrates.
2. Do not smoke while handling or using insecticides.
3. Keep your face turned to one side when opening, pouring from, or emptying insecticide containers.
4. Leave unused insecticides in their original containers with the labels on them.
5. Store insecticides out of the reach of children, irresponsible persons, or animals; store preferably in a locked building. Do not store near livestock feeds. Better yet, buy no more pesticide than you will use. This eliminates a pesticide storage and disposal problem.
6. Wash out and bury, burn, or haul to the refuse dump all empty insecticide containers.
7. Do not put the water-supply hose directly into the spray tank.
8. Do not blow out clogged nozzles or spray lines with your mouth.
9. Wash with soap and water exposed parts of the body and clothes contaminated with insecticides.
10. Do not leave puddles of spray on impervious surfaces.
11. Do not apply to fish-bearing or other water supplies.
12. Do not apply insecticides, except in an emergency, to areas with abundant wildlife.
13. Do not apply insecticides near dug wells or cisterns.
14. Do not spray or dust when weather conditions favor drift.
15. Observe all precautions listed on the label.
16. To avoid bee kill, apply insecticides after bee activity has been completed for the day; use the least toxic materials. *Warn beekeepers that you are applying insecticides.*

POLICY STATEMENT

Suggestions for the use of insecticides are based on available data. The soil texture, soil pH, rainfall, slope of the field, wind velocity at planting, and other unpredictable factors will affect efficiency. Please report control failures and the associated circumstances to the county Extension adviser in agriculture.

Requested label clearances for a few uses of some insecticides, carriers, and solvents are uncertain for 1979 since many requests have not yet been officially cleared. Anticipating needed changes in labeling, we began modifying these suggested uses a few years ago. We have attempted to anticipate any further label changes for 1979, but an occasional use may still be canceled. Be sure to check with your county Extension adviser in agriculture if you are in doubt about an insecticide you plan to use. We will make announcements of label changes through the news media to keep you up to date.

FIELD CORN

Insect	Time of attack	Insecticide ¹	Pounds of active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Corn rootworm	June-August	Counter Dyfonate Furadan Lorsban Mocap Thimet	1 ² 1 ² 1 ² 1 ² 1 ² 1 ²	7-inch band	Apply ahead of planter press wheel. See discussion on page 4. Basal treatments during cultivation with Furadan, Dyfonate, Thimet, or Mocap are effective in late May or early June.
Seed-corn beetle	At germination	diazinon	1½ oz. per bu. of seed	On seed	Or as a band treatment, use Dyfonate or Thimet.
Seed-corn maggot	At germination	diazinon	1½ oz. per bu. of seed	On seed	Or apply Counter in the furrow or band treatments of Dyfonate.
Wireworm	May-June	Counter Dyfonate Furadan Mocap Thimet	1 ² 4 2 ² 1 ² 1 ²	Furrow Broadcast Furrow 7-inch band 7-inch band	Counter and Furadan should be applied in the seed furrow. Except for Dyfonate, apply all others as a 7-inch band ahead of the press wheel. If infestations are severe, control may not be satisfactory. Counter and Thimet are labeled for the reduction of wireworms.
White grub	May-October	The soil insecticides suggested for wireworms will give partial control of white grubs and grape colaspis. Furadan and Counter should be applied in the seed furrow and the other insecticides in a 7-inch band ahead of the press wheel. However, they are not labeled for these pests.			
Grape colaspis	May-June				
Sod webworm	May-June	toxaphene	2	At base of plant	At time of initial attack.
Cutworms	May-June	Lorsban granules	1	7-inch band	Apply ahead of press wheel at planting. Controls moderate to low infestations.
		Mocap granules	1	7-inch band	Apply ahead of press wheel at planting. Aids in control.
		†Lorsban spray	1½	Broadcast	Apply as rescue treatment when damage appears.
		Sevin bait	1-2	Broadcast	Apply as rescue treatment when damage appears.
		Sevin spray	2	Plant base	Apply as rescue treatment when damage appears. Use 1 quart of molasses per acre in the spray mix.
		Dylox spray	1	Plant base	Apply as rescue treatment when damage appears.
Billbug	May-June	toxaphene	2	At base of plant	Apply sprays as needed.
Garden symphylan	May-July	Dyfonate	2	Broadcast	Before planting, lightly incorporate.
Grasshopper	June-September	Sevin toxaphene diazinon †Cygon	1 2 ½ ½	Over row as spray	As needed. For ensilage corn use Sevin or diazinon.
Flea beetle	May-June	Sevin diazinon toxaphene	1 ½ 2	Over row as spray	When damage becomes apparent on small corn.
Armyworm	May-August	†Sevin toxaphene Dylox *Lannate ³	1½ 2½ 1 ½	Over row as spray	At first migration or when leaves below ear level are consumed and worms are eating leaves above ear level.
Fall armyworm	July-September	Sevin diazinon Dylox *Lannate ³	1½ 1 1 ½	In whorls	Granules preferred when worms deep in whorl. If worms are small and out on leaves, sprays are effective.
Chinch bug	June-August	toxaphene Sevin	2-3 1½	Spray at base of plant	At start of migration.
Thrips	June	malathion	1	On foliage as spray	When severe wilting and discoloration are noticed.
Japanese beetle	July-August	Sevin	1	Over plant	During the silking period to protect pollination.
Corn leaf aphid	July-August	malathion diazinon	1 1	Foliage spray	Apply during late whorl to early tassel when 50% of the plants have light to moderate infestations.

* Use restricted to certified applicators only. † State-labelled insecticide. Applicator must have Illinois label in possession when applying.

¹ See page 11 for insecticide restrictions.

² Based on 40-inch row spacing. Increase rates for narrow rows.

³ To be applied only by experienced operators or those wearing protective clothing.

FIELD CORN (continued)

Insect	Time of attack	Insecticide ¹	Pounds of active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Corn rootworm adults	Late July, early August	Sevin	1	Overall spray or directed towards silk	Before 75% of plants have silked, if there are more than 5 beetles per ear and if silk clipping is observed. Only to protect pollination.
		malathion	1		
		*†Pennacap M diazinon	$\frac{1}{2}$ $\frac{1}{2}$		
Corn borer, first generation	June-July	Sevin granules	1½	On upper ½ of plant and into whorl	When 50% or more plants show recent whorl feeding and plants are over 36" tall.
		diazinon granules	1		
		Furadan granules	1		
		Dyfonate granules	1		
		Thimet granules	1		
Corn borer, second generation	Mid-August	*†Pennacap-M	1	Over row	Apply at first hatch when there are 50 or more egg masses per 100 plants.
		Sevin granules	1½		
		diazinon granules	1		
		Furadan granules	1		
Southwestern corn borer	August	Dyfonate granules	1	From ear upward	Direct granules into whorls. Apply when 25% of plants have egg masses or larvae on leaves. Early-planted corn usually escapes damage.
		Furadan granules	1		

* Use restricted to certified applicators only. † State-labelled insecticide. Applicator must have Illinois label in possession when applying.

¹ See page 11 for insecticide restrictions.

STORED GRAIN (Corn, Wheat, and Oats)¹

Insect	Time of attack	Insecticide and dilution	Dosage	Placement	Suggestions (See table of limitations, page 11)
Angoumois grain moth (earcorn)	April-October (southern $\frac{1}{3}$ of Illinois only)	malathion 57% E.C., 3 oz. per gal. water	Apply to runoff	Spray surface and sides May 1 and August 1	Plant tight husk varieties. Store as shelled corn to avoid all but surface damage by angoumois moth.
Meal moths and surface infestations only ³	April-October	dichlorvos 20% (DDVP, Vapona) plastic resin strip ³	1 per 1,000 cu. ft. space above grain mass	Attach to ceiling or side wall	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Install June 1 or at storage. Replace in mid-August.
		pyrethrin 6% + piperonyl butoxide 60% E.C., 4½ oz. per gal. water	2 gal. per 1,000 sq. ft.	Spray grain surface, bin walls, and ceiling	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Apply June 1 or at storage and monthly thereafter during summer months.
General					
Internal and external feeders	April-October	malathion 57% E.C., 1 pt. per 3-5 gal. water ⁴	3-5 gal. per 1,000 bu.	Spray uniformly as grain is binned	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Protect surface with dichlorvos resin strips or pyrethrin spray as recommended for meal moths.
Rice and granary weevils					
Flat grain beetle					
Saw-toothed grain beetle		liquid fumigant ^{5, 6}	3-5 gal. per 1,000 bu.	On surface; repeat if necessary	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Apply in late July and September in the southern half of Illinois; apply in mid-August in the northern half of Illinois. Protect surface with dichlorvos resin strips or pyrethrin spray as recommended for meal moths.
Rusty grain beetle		*methyl bromide +	As directed	On surface	
Foreign grain beetle		*ethylene dibromide ^{6, 7}			
Cadelle beetle					
Flour beetle		*aluminum phosphide ^{6, 8}	180 tablets per 1,000 bu.	Tablets 2 feet apart	

* Use restricted to certified applicators only.

¹ Corn need not be treated if harvested after October 1 unless it is to be carried over the following summer. Wheat and oats should be treated if they are to be held for one month or more in storage after harvest.

² Remove webbing before treatment.

³ Effective only in enclosed bins. Kills adult moths but not the eggs or larvae. Several weeks required to effectively control an existing infestation. Also cleared for use in bins of stored soybeans.

⁴ Use only the grade of malathion labeled for use on stored grain. Apply after drying, as malathion vaporizes and is lost rapidly when grain is heat-dried.

⁵ Some common liquid fumigants are: *carbon bisulfide + *carbon tetrachloride, *ethylene dichloride + *carbon tetrachloride, *ethylene dichloride + *ethylene dibromide + *carbon tetrachloride, etc.

⁶ Use with extreme caution. Apply only under calm conditions and when grain temperature is 70° F. or above. Grain should be 8 inches below the lip of the bin and should be leveled before fumigating.

⁷ Called the 73 mixture.

⁸ Called *Phostoxin. Slow vaporization with a 3-day exposure period.

ALFALFA AND CLOVER

Insect	Time of attack	Insecticide ¹	Pounds of active ingredient per acre	Placement	Timing of application ² (See table of limitations, page 11)
Alfalfa weevil (Spring treatment)	March-June	Furadan ^{3,4}	$\frac{1}{4}$	On foliage	Refer to Circular 1136. Or, when 25% of the tips are being skeletonized and there are 3 or more larvae per stem, treat immediately; two treatments may be necessary on first cutting; regrowth following first cutting may need protection. By ground, use a minimum of 20 gal. of finished spray per acre (10 gal. on stubble) or 4 gal. by air. Do not apply during bloom. Instead, cut and remove the hay.
		*Guthion ³	$\frac{1}{2}$		
		*methyl parathion ³	$\frac{1}{2}$		
		Supracide ³	$\frac{1}{2}$		
		malathion plus methoxychlor	$\frac{3}{4}$		
		diazinon plus methoxychlor (Alfatox)	$\frac{1}{2}$		
		Imidan	1		
		*PennCap-M	$\frac{1}{2}$		
Clover leaf weevil	March-April	malathion	1	On foliage	When larvae are numerous and damage is noticeable, usually early to mid-April.
Spittlebug	Late April, early May	*Guthion ³	$\frac{1}{2}$	On foliage	When spittle masses are found and nymphs average over 1 per stem.
		malathion	1		
Aphid	April-May	Cygon or De-Fend	$\frac{1}{2}$	On foliage	When aphids are becoming abundant and lady beetle larvae and adults, parasites, and disease are slight.
		diazinon	$\frac{1}{2}$		
		malathion	1		
Leafhopper	Early July	Sevin	1	On foliage	When second-growth alfalfa is 4 to 6 inches high, or as needed.
		diazinon	$\frac{1}{2}$		
		Cygon or De-Fend	$\frac{1}{2}$		
		Dylox	$\frac{3}{4}$		
		Supracide ³	$\frac{1}{2}$		
Webworm	July-August	Sevin	1	On foliage	When damage appears.
		Dylox	1		
Variegated cutworm	April-June	Sevin bait	$1\frac{1}{2}$	On foliage	Cut, remove hay, and spray immediately.
		Dylox	1		
		*methyl parathion ³	$\frac{1}{2}$		
Armyworm	May-June, September	Sevin	$1\frac{1}{2}$	On foliage	Only when grasses are abundant.
		malathion	$1\frac{1}{4}$		
		Dylox	1		
Grasshopper	June-September	Cygon or De-Fend	$\frac{1}{2}$	On foliage	When grasshoppers are small and before damage is severe. When plants are blooming, do not apply Sevin or Cygon. Apply others only late in day.
		Sevin	1		
		diazinon	$\frac{1}{2}$		
		malathion	$1\frac{1}{4}$		
		Furadan ^{3,4}	$\frac{1}{4}$		

* Use restricted to certified applicators only.

¹ See page 11 for insecticide restrictions.

² Before applying insecticides, be certain to clean all herbicides out of equipment. During pollination, apply very late in day or, if possible, avoid application during bloom.

³ To be applied only by experienced operators or those wearing protective clothing.

⁴ Only for pure stands of alfalfa. When using no more than $\frac{1}{4}$ pound per acre, allow 7 days between application and harvest. If you use $\frac{1}{4}$ to $\frac{1}{2}$ pound per acre, allow 14 days to elapse between application and harvest.

SMALL GRAINS (Barley, Oats, Rye, Wheat)

Insect	Time of attack	Insecticide ¹	Pounds of active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Armyworm	May-June	malathion	$1\frac{1}{4}$	On foliage	When worms are still small and before damage is done. Do not use Dylox on rye.
		toxaphene ²	$1\frac{1}{2}$		
		Dylox	$\frac{3}{4}$		
Greenbug English grain aphid	May-June	Cygon	$\frac{1}{4}$	On foliage	When needed. PennCap-M is cleared for greenbug only. Use Cygon and PennCap-M on wheat only.
		*Systox ³	$\frac{1}{4}$		
		*parathion ³	$\frac{1}{4}$		
		*PennCap-M	$\frac{1}{4}$		
Hessian fly	Sept.-October; April-May	malathion	1	In drill row	Use granules in a grass-seeder for susceptible varieties planted before fly-free date.
		Di-Syston granules Thimet granules	1 1		

* Use restricted to certified applicators only.

¹ See page 11 for insecticide restrictions.

² For use on dairy farms only when alternate material is not available and when insect emergency exists. Do not apply as foliage sprays or dusts to or adjacent to dairy pasture, hay, or forage crops.

³ To be applied only by experienced operators or those wearing protective clothing.

SOYBEANS

Insect	Time of attack	Insecticide ¹	Pounds of active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Seedcorn maggot	May-June	diazinon	1½ oz. per bu. of seed	On seed	At planting time.
Bean leaf beetle	May-June, August	Sevin ² *Guthion ⁴	1 ½	On foliage	When leaf feeding becomes severe, but before plants killed or pods eaten.
Grasshopper	June-September	†Cygon Sevin ² malathion ULV toxaphene ³ †Sevin 4-Oil	½ 1 0.6 2½ 1	On foliage	When migration from adjacent crops begins.
Green clover worm	August	Sevin ² malathion *Lannate ⁴ Dipel †Sevin 4-Oil	1 1¾ ¼ (see label) 1	On foliage	When damage occurs between blooming and pod fill. Usually requires 12 or more half-grown worms per foot of row and 15% defoliation to justify treatment.
Webworm	June-August	Sevin ²	1		Usually requires 15% or more defoliation between blooming and pod-fill to justify treatment.
Mites	June-August	Trithion ⁴ Cygon	¾ ½	On foliage	As needed on field margins and entire field.
Stink bugs	July and August	*Guthion ⁴	½	On foliage	As needed when bugs are numerous; 1 per yard of row may cause damage.
Thrips	June-August	Sevin ²	1	On foliage	As needed.

* Use restricted to certified applicators only. † State-labelled insecticide. Applicator must have Illinois label in possession when applying.

¹ See page 11 for insecticide restrictions on soybeans.

² Sevin should not be used at more than 1 lb. per acre. Higher rates may damage plants.

³ For use on dairy farms only when alternate material is not available and when insect emergency exists. Do not apply as foliage sprays or dusts to or adjacent to dairy pasture, hay, or forage crops.

⁴ To be applied only by experienced operators or those wearing protective clothing.

GRAIN SORGHUM

Insect	Time of attack	Insecticide ¹	Pounds of active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Webworm	After heads form	Sevin	1½	On grain head	When 10 to 25 percent of the heads are infested with 5 or more larvae per head. Pest usually bad in wet seasons on late-planted grain.
Corn earworm	After heads form	Sevin	1½	Direct at head or broadcast	When there is an average of 2 worms per head.
Midge	August-September	Cygon diazinon Sevin	¼ ¼ 1½	Direct at head	When 50% of heads have begun to bloom and there are 1 or more midge adults per head.
Corn leaf aphids	All season	Cygon malathion	¼ 1	Broadcast	Under drouth conditions when populations are heavy and damage is apparent.
Greenbug	June-July	Cygon or De-Fend malathion	¼ 1	Broadcast	When greenbug damage is sufficient to cause death of more than 2 normal-sized leaves before the hard-dough stage.
Fall armyworm	July-August	Sevin	1½	Over row	When there is an average of 2 worms per head. Whorl feeding is seldom economic.

¹ See page 11 for insecticide restrictions.

GRASS PASTURES AND NONCROP AREAS

Insect	Time of attack	Insecticide ¹	Pounds of active ingredient per acre	Placement	Timing of application
Grasshoppers	June-July	Sevin 4-Oil malathion Sevin †Cygon diazinon	1 1 1 0.5 0.5	On foliage	When nymphs are abundant and before migration into row crops. Treat while hoppers are small.

¹ See page 11 for insecticide restrictions. † State-labelled insecticide. Applicator must have Illinois label in possession when applying.

**LIMITATIONS IN DAYS BETWEEN APPLICATION OF THE INSECTICIDE AND HARVEST OF THE CROP
AND OTHER RESTRICTIONS ON THE USE OF INSECTICIDES FOR FIELD CROP INSECT CONTROL**
(Blanks in the table denote that the material is not suggested for that specific use in Illinois)

	Worker re-entry times ^a (hours)	Field corn			Sorghum	Forage crops			
		Seed and soil	Grain	Ensilage and stover		Alfalfa	Clover	Pasture	Seed
Counter (terbufos)	...	A	...	...	...	...	...	...	...
Cygon (dimethoate)	28	10,B	...	...	...
De-Fend (dimethoate)	28	10,B	...	...	...
diazinon	...	A	...	0	7	7	7	0	...
Dyfonate (fonofos) ^b	...	A	45	45	...	...	...	...	...
Dylox (trichlorfon)	C	C	...	0,C	0,C	0	...
Furadan (carbofuran) ^b	...	A	...	D	...	7,E	...	...	...
*Guthion (azinphosmethyl) ^{a,b}	24	...	...	...	...	16,B	16,B	...	...
Imidan (phosmet)	7,B	...	...	...
*Lannate (methomyl) ^{a,b}	0	3	...	7	...	...	...
Lorsban (chlorpyrifos)	...	A	...	...	...	...	...	...	...
malathion	5	5	7	0	0	0	0
*methyl parathion ^{a,b}	48	...	...	...	...	15	15	...	...
Mocap (ethoprop) ^b	...	A	...	...	...	...	...	...	...
*PennCap-M ^{a,b,c}	12	12	...	15	...	...	...
Sevin (carbaryl)	0	0	21	0	0	0	...
Supracide ^b	10,G	...	...	...
Thimet (phorate)	...	A	30,H	30,H	...	...	...	...	...
toxaphene	28,A	I	...	...	...	...	...

		Barley		Oats		Rye		Wheat		Soybeans	
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Forage
Cygon (dimethoate)	...	...	...	...	...	...	...	60	60	21	5
Dipel (<i>Bacillus thuringiensis</i>)	...	...	...	...	...	...	...	...	...	0	0
Di-Syston (disulfoton)	...	...	...	...	...	...	...	...	E,K	...	...
Dylox (trichlorfon)	...	21	21	21	21	...	...	21	21	...	...
*Guthion (azinphosmethyl) ^{a,b}	24	...	...	...	...	...	...	...	...	45	F
*Lannate (methomyl) ^{a,b}	...	...	...	...	...	...	...	...	...	14	7
malathion	...	7	7	7	7	7	7	7	7	3	3
*parathion ^{a,b}	48	15	15	15	15	...	...	15	15	...	...
*PennCap-M ^{a,b,c}	...	...	...	...	...	...	...	15	15	20N	20N
Sevin (carbaryl)	...	...	...	...	...	...	...	...	...	0	0
*Systox (demeton) ^{a,b}	48	45,L	...	45,L	...	...	...	45,L	...	...	...
Thimet (phorate)	...	...	...	...	...	...	...	...	M	...	...
toxaphene	...	A	J	A	J	A	J	A	J	21	J
Trithion (carbophenothion) ^{a,b}	48	...	...	...	...	...	...	...	...	7	F

* Use restricted to certified applicators only.

^a Workers should be warned in advance of treatments. Workers may not enter fields treated with the insecticides without wearing protective clothing for the intervals indicated. They may not enter a field treated with other insecticides until the spray has dried or the dust has settled without wearing protective clothing. Protective clothing includes a hat, long-sleeved shirt, long-legged pants, and shoes and socks.

^b Sprays to be applied only by experienced operators wearing proper protective clothing.

^c Microencapsulated.

A. No specific restriction when used as recommended.

B. Apply only once per cutting, and do not apply during bloom.

C. Three applications may be made per season. Can be applied up to harvest.

D. Do not make a foliar application if Furadan 10 granules were applied at more than 10 pounds per acre at planting. Do not make more than two foliar applications per season.

E. Make no more than one application per season.

F. Do not graze or feed treated vines to livestock.

G. Make no more than one foliage and one stubble application per cutting.

H. Besides treatment at planting, one more application can be made at cultivation or over the corn later in the season.

I. Do not feed treated forage to dairy animals. Do not feed sprayed forage or granular-treated corn silage to livestock fattening for slaughter. Do not graze meat animals on granular-treated stover within 28 days of slaughter.

J. Do not graze or feed treated forage to dairy animals or to animals being finished for slaughter.

K. Do not graze treated wheat within 30 days of treatment.

L. Apply no more than twice per season with at least 14 days between applications. Do not graze treated fields.

M. Do not graze treated wheat within 45 days of treatment.

N. Make no more than two applications per season.

REFERENCES

This circular lists only suggested uses of insecticides for the control of many pests in Illinois field crops, and is not designed to discuss other methods of control. Fact sheets discussing nonchemical control methods, descriptions of specific insects, and their life history and biology (designated by NHE numbers) can be obtained from the office of the county Extension adviser in agriculture or by writing to Entomology Extension, 169 Natural Resources Building, Urbana, IL 61801.

Alfalfa Weevil—NHE-89
Angoumois Grain Moth—
NHE-62
Aphid—NHE-14 and 19
Armyworm—NHE-21
Bean Leaf Beetle—NHE-67
Billbug—NHE-37
Chinch Bug—NHE-35
Clover Leaf Weevil—
NHE-12
Clover Root Curculio—
NHE-71
Corn Earworm—NHE-33
Corn Leaf Aphid—NHE-29
Corn Rootworm—NHE-26
Cutworm—NHE-38
Fall Armyworm—NHE-34

Flea Beetle—NHE-36
Garden Webworm—NHE-42
Grape Colaspis—NHE-25
Grasshopper—NHE-74
Green Clover Worm—
NHE-75
Internal and External
Feeders—NHE-64 and 65
Leafhopper—NHE-22
Meal Moths—NHE-63
Sod Webworms—NHE-42
Spittlebug—NHE-13
Sweet Clover Weevil—
NHE-15
Thrips—NHE-39
White Grub—NHE-23
Wireworm—NHE-43

The following circulars can be obtained from the county Extension adviser in agriculture, or by writing to the Office of Publications, College of Agriculture, 123 Mumford Hall, Urbana, IL 61801.

Circular 898, *1979 Insect Pest Management Guide—Livestock and Livestock Barns*

Circular 900, *1979 Insect Pest Management Guide—Home, Yard, and Garden*

The suggestions given in this circular are revised annually by entomologists of the College of Agriculture and the Illinois Natural History Survey.